UNIVERSITI SAINS MALAYSIA

Second Semester Examination
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EBS 418E/3 – Petroleum Engineering
[Kejuruteraan Petroleum]

Duration: 3 hours
[Masa: 3 jam]

Please check that this examination paper consists of EIGHTEEN pages of printed material, TWO pages APPENDIX and ONE page ANSWER SHEET For Objective Question before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi LAPAN BELAS muka surat bercetak, DUA muka surat LAMPIRAN dan SATU muka surat KERTAS JAWAPAN untuk soalan Objektif sebelum anda memulakan peperiksaan].

This paper contains 60 Objective questions in Section A and 3 Subjective questions in Section B.

[Kertas soalan ini mengandungi 60 soalan Objektif dalam Bahagian A dan TIGA soalan Subjektif dalam Bahagian B].

Instructions: Answer **ALL** Objective questions from Section A and any **TWO** questions from Section B.

[Arahan: *Jawab* ***SEMUA*** *soalan Objektif daripada Bahagian A dan mana-mana* ***DUA*** *soalan daripada Bahagian B].*

Answer to any Subjective question must start on a new page. For the Objective type questions, make use of the answer sheet as provided in the Appendix.

[Mulakan jawapan anda untuk setiap soalan subjektif pada muka surat yang baru. Bagi soalan Objektif, gunakan kertas jawapan objektif yang disediakan dalam Lampiran].

All questions must be answered in English language. However, ONE question can be answered in bahasa Malaysia.

[Semua soalan mesti dijawab dalam bahasa Inggeris. Walau bagaimanapun, SATU soalan dibenarkan dijawab dalam bahasa Malaysia].

...2/-

SECTION A

BAHAGIAN A

This section is referred as question number 1 which is made up of 60 objective type questions. You are required to attempt all questions and your answer should be on THE OBJECTIVE QUESTIONS ANSWER SHEET as provided in the Appendix 1.

Bahagian ini dirujuk sebagai soalan numbor 1 yang terdiri daripada 60 soalan objektif. Anda diperlukan cuba menjawap semua soalan dan jawapan anda hendaklah dibuat di atas kertas jawapan soalan objectif yang disediakan di lampiran 1

1. 1.1 Petroleum in Malaysia is developed through a national petroleum company namely Petronas as authorize through a law referred as .....

A. Mineral Development Act 1994
B. Petroleum Act 1967
C. Petroleum Mining Act 1966
D. Petroleum Development Act 1974

1.1 Petroleum di Malaysia dibangunkan melalui sebuah syarikat petroleum nasional iaitu Petronas yang diberi kuasa melalui undang-undang iaitu .....

A. Akta Pembangunan Mineral 1994
B. Akta Petroleum 1967
C. Akta Perlombongan Petroleum 1966
D. Akta Pembangunan Petroleum 1974

1.2 For developing the petroleum resources in Malaysia, Petronas adopts the Production Sharing Contract system. Before this what kind of system was used by the government in developing the petroleum with the foreign oil companies?

A. Petroleum tax system
B. Concession system
C. Company Sharing System
D. Royalty system

1.2 Untuk membangunkan sumber petroleum di Malaysia, Petronas menggunakan sistem Kontrak Kongsi Pengeluaran. Sebelum ini sistem apakah yang digunakan oleh kerajaan untuk membangun-kan sumber petroleum dengan syarikat minyak asing?

A. Sistem cukai petroleum
B. Sistem konsessi
C. Sistem kongsi syarikat
D. Sistem royalti

1.3 The provisions of the Production sharing contracts are:

I. The contractor shall recover the operational cost after the oil and gas is produced.
II. Oil and gas produced are shared in kind between the Petronas and the contractor at an agreed percentage.
III. The revenue from the sales of crude oil and gas is shared between Petronas and the contractor.
IV. The contractor has to pay royalty and tax to Petronas.

1.3 Peruntukan-peruntukan daripada Kontrak Kongsi Pengeluaran adalah:

I. Kontraktor boleh memperolehi kos operasi setelah minyak dan gas dikeluarkan.
II. Minyak dan gas yang dikeluarkan dikongsi dalam bentuk semula jadi di antara Petronas dan kontraktor pada tahap peratusan yang telah dipersetujui.
III. Hasil jualan minyak mentah dan gas dikongsi di antara Petronas dan kontraktor.
IV. Kontraktor perlu membayar royalti dan cukai kepada Petronas.

A. All of the above
B. II and IV
C. II and III
D. I and II

A. Semua di atas
B. II dan IV
C. II dan III
D. I dan II

1.4 What is meant by crude oil?

A. The fluid produced from a formation.
B. A mixture of hydrocarbon exists in the liquid phase in the natural reservoir and still in the liquid phase under atmospheric pressure.
C. All liquid that is produced from an oil well.
D. A mixture of hydrocarbon in the form of liquid and gas.

1.4 Apakah yang dimaksudkan sebagai minyak mentah?

A. Bendalir yang dikeluarkan daripada formasi.
B. Suatu campuran hidrokarbon yang terjadi dalam fasa cecair dalam reservoir semula jadi dan masih dalam fasa cecair di bawah tekanan atmosfera.
C. Semua cecair yang dikeluarkan daripada telaga minyak.
D. Suatu campuran hidrokarbon dalam bentuk cecair dan gas

1.5 What is meant by sweet gas and sour gas in petroleum engineering?

A. Gas that contains petroleum and condensate.
B. Liquified natural gas from the reservoir and gas produced from the refinery.
C. Gas generated by bacteria and gas generated by the heat at subsurface condition.
D. Low or high content of H_2S

1.5 Apakah yang dimaksudkan dengan gas manis dan gas masam dalam kejuruteraan petroleum?

A. Gas yang mengandungi petroleum dan kondensat.
B. Gas asli cecair daripada reservoir dan gas yang dikeluarkan daripada loji penapis minyak.
C. Gas yang dihasilkan oleh bakteria dan gas yang dihasil-kan oleh suhu pada keadaan bawah tanah.
D. Rendah atau tingginya kandungan H_2S.

1.6 Most of the petroleum deposits are found in .....

A. igneous rock
B. sedimentary rock
C. metamorphic rock
D. carbonate rock

1.6 Kebanyakan mendapan petroleum terdapat di dalam .....

A. batuan igneus
B. batuan sedimen
C. batuan metamorf
D. batuan karbonat

1.7 Which of the followings are the basic form of petroleum?

I. Crude oil
II. Diesel
III. Natural Gas
IV. Condensate

A. All of the above
B. I, II and III
C. I, III and IV
D. I and II

1.7 Yang manakah seperti berikut adalah bentuk asas petroleum?

I. minyak mentah
II. disel
III. gas asli
IV. kondensat

A. semua di atas
B. I, II dan III
C. I, III dan IV
D. I dan II

1.8 The density of oil is measured in ^{0}API at the temperature of 60^{0}F and at atmospheric pressure. Which of the following relationship is correct?

1.8 Ketumpatan minyak diukur dalam ^{0}API pada suhu 60^{0}F dan tekanan atmosfera. Hubungan yang manakah seperti berikut yang betul?

A. $X^0\ API = \frac{141.5}{\text{specific gravity}} - 131.5$

B. $X^0\ API = \frac{\text{specific gravity}}{141.5} - 131.5$

C. $X^0\ API = \frac{141.5}{131.5} - \text{specific gravity}$

D. $X^0\ API = \frac{141.5 + \text{specific gravity}}{\text{specific gravity}} - 131.5$

1.9 What is the only method of finding oil in the ground?

A. By drilling a well and penetrating a reservoir.
B. By seismic method that can show where oil can be found.
C. By geophysical methods.
D. By gravity method

1.10 What is the source rock?

A. The source rock is the sandstone and carbonate rock
B. The source rock is normally of the sedimentary rock type such as clay or shale.
C. The source rock is granite that generated oil and gas
D. The source rock is the rock that forms the reservoir for oil and gas.

1.11 Reservoir rock is .....

A. the porous rock such as sandstone and carbonate rock with overlying impermeable rock.
B. the shale that generated oil and gas.
C. made up of sedimentary rocks.
D. the man-made underground reservoir for oil storage.

1.12 What is meant by a reservoir in petroleum engineering?

A. A pool of oil in the surface.
B. An underground excavation for the storage of crude oil.
C. A rock mass near the surface that is suitable to accumulate gas and oil.

A. $X^0\ API = \frac{141.5}{graviti\ tentu} - 131.5$

B. $X^0\ API = \frac{graviti\ tentu}{141.5} - 131.5$

C. $X^0\ API = \frac{141.5}{131.5} - graviti\ tentu$

D. $X^0\ API = \frac{141.5 + graviti\ tentu}{graviti\ tentu} - 131.5$

1.9 Apakah satu-satunya kaedah untuk mendapatkan minyak di dalam bumi?

A. Dengan menggerudi suatu telaga dan menembusi suatu reservoir.
B. Dengan kaedah seismos yang boleh menunjukkan di manakah minyak boleh dijumpai.
C. Dengan kaedah geofizik.
D. Dengan kaedah graviti.

1.10 Apakah batuan sumber?

A. Batuan sumber ialah batu pasir dan batuan karbonat.
B. Batu sumber kebiasaannya adalah jenis batuan sedimen seperti lempung atau syal.
C. Batuan sumber ialah granit yang menjanakan minyak dan gas.
D. Batuan sumber adalah batuan yang merupakan reservoir untuk minyak dan gas.

1.11 Batuan reservoir adalah .....

A. batuan yang berongga seperti batu pasir dan batuan karbonat dengan batuan tidak telap di atasnya.
B. batuan syal yang menjanakan minyak dan gas.
C. terdiri daripada batuan sedimen.
D. Reservoir bawah tanah yang dibuat oleh manusia untuk menyimpan minyak.

1.12 Apakah yang dimaksudkan dengan reservoir dalam kejuruteraan petroleum?

A. Suatu takungan minyak di permukaan.
B. Suatu pengorekan bawah tanah untuk penyimpanan minyak mentah.
C. Suatu jisim batuan berhampiran dengan permukaan yang sesuai untuk mengumpul gas dan minyak.

D. A subsurface rock body which has a porosity and suitable permeability where oil or gas can accumulate.

D. Suatu jasad batuan sub-permukaan yang mempunyai keporosan dan keboletelapan di mana minyak dan gas boleh terkumpul.

1.13 What is rock porosity?

A. The ratio of volume of voids to the volume solid in rock.
B. The ratio of the volume of voids in rock to the volume of air in the rock.
C. The ratio of the volume of void in rock to the bulk volume of the rock.
D. The ratio of the volume of solid in the rock to the volume of void in the rock.

1.13 Apakah keporosan batuan?

A. Nisbah isipadu rongga kepada isipadu pepejal dalam batuan.
B. Nisbah isipadu rongga dalam batuan kepada isipadu udara dalam batuan.
C. Nisbah isipadu rongga dalam batuan kepada isipadu pukal batuan.
D. Nisbah isipadu pepejal dalam batuan kepada isipadu rongga dalam batuan

1.14 Other than porosity, ... is necessary to make a rock suitable as a reservoir for oil and gas.

A. mobility
B. permeability
C. porous
D. bubble point pressure

1.14 Selain daripada keporosan, ... adalah perlu untuk menjadikan sesuatu batuan itu sesuai sebagai reservoir untuk minyak dan gas.

A. mobiliti
B. kebolehtelapan
C. poros
D. tekanan titik gelembung

1.15 The position of oil, gas and water in the anticlinal reservoir.

A. Gas at the top, water in the middle and oil at the bottom
B. Oil at the top, water in the middle and gas at the bottom.
C. Gas at the top, oil in the middle and water at the bottom
D. Water at the top, gas in the middle and oil at the bottom

1.15 Kedudukan minyak, gas dan air dalam reservoir antiklin.

A. Gas di atas, air di tengah dan minyak di bawah.
B. Minyak di atas, air di tengah dan gas di bawah.
C. Gas di atas, minyak di tengah dan air di bawah.
D. Air di atas, gas di tengah dan minyak di bawah

1.16 For an oil reservoir that has a water saturation of S_w, what is the value of oil saturation?

A. B_o
B. $(1 - S_w)$
C. $B_o - S_w$
D. $S_w - B_o$

1.16 Bagi suatu reservoir minyak yang mempunyai ketepuan air S_w, apakah nilai ketepuan minyak?

A. B_o
B. $(1-S_w)$
C. $B_o - S_w$
D. $S_w - B_o$

1.17 What type of drive produced the best recovery of oil?

A. Water drive
B. Gas cap drive
C. Solution gas drive
D. Combination drive

1.17 Jenis pacuan apakah yang menghasilkan perolehan minyak yang paling baik?

A. Pacuan air
B. Pacuan tukup gas
C. Pacuan gas larutan
D. Pacuan campuran

1.18 Normally the production of oil is quoted in Stock Tank Barrel (STB) and the production of gas in Standard Cubic Feet (SCF). What is meant by these units?

A. The volume of oil and gas produced in the reservoir temperature and pressure.
B. The volume of oil and gas at surface.
C. The volume of oil and gas that has been compressed and stored in special tanks at surface.
D. The volume of oil and gas produced at the standard temperature of 60^0 F and standard pressure of 14.7 psia.

1.18 Pengeluaran minyak biasanya disebut dalam tong tangki stok (STB) dan pengeluaran gas dalam kaki padu piawai (SCF). Apakah maknanya bagi unit-unit ini?

A. Isipadu minyak dan gas yang dikeluarkan dalam keadaan suhu dan tekanan reservoir.
B. Isipadu minyak dan gas di permukaan.
C. Isipadu minyak dan gas yang telah dimampatkan dan disimpan dalam tangki khas di permukaan.
D. Isipadu minyak dan gas yang dikeluarkan pada suhu piawai 60^0 F dan tekanan piawai 14.7 psia.

1.19 What is GOR?

A. $\frac{\text{the volume of gas in the reservoir}}{\text{the volume of oil in the reservoir}}$

B. $\frac{\text{the volume of gas produced at std cond.}}{\text{the volume of oil produced at std cond.}}$

C. $\frac{\text{the volume of oil at surface}}{\text{the volume of gas at reservoir}}$

D. $\frac{\text{the volume of dissolved gas}}{\text{the volume of oil in the reservoir}}$

1.19 Apakah GOR?

A. $\frac{\text{isipadu gas dalam reservoir}}{\text{isipadu minyak dalam reservoir}}$

B. $\frac{\text{isipadu gas keluaran (keadaan piawai).}}{\text{isipadu minyak keluaran (keadaan piawai)}}$

C. $\frac{\text{isipadu minyak di permukaan}}{\text{isipadu gas di reservoir}}$

D. $\frac{\text{isipadu gas terlarut}}{\text{isipadu minyak dalam reservoir}}$

1.20 The unit for GOR is .....

A. RCF/RB C. STB/RCF
B. SCF/STB D. RCF/STB

1.20 Unit untuk GOR ialah .....

A. RCF/RB C. STB/RCF
B. SCF/STB D. RCF/STB

1.21 According to the ideal gas law, Z is the deviation factor and it is also known as .....

A. formation volume factor
B. gas volume factor
C. gas volume factor in the reservoir
D. compressibility factor

1.21 Menurut hukum gas unggul, Z ialah faktor sisihan dan ia juga dikenali sebagai .....

A. faktor isipadu formasi
B. faktor isipadu gas
C. faktor isipadu gas dalam reservoir
D. faktor kebolehmampatan

1.22 What is formation volume factor, B_o?

A. A ratio of volume of oil occupied in the reservoir to the volume of tank oil.
B. A ratio of tank oil volume occupied to the reservoir volume.

1.22 Apakah faktor isipadu formasi bagi minyak, B_o?

A. Suatu nisbah isipadu minyak dalam reservoir kepada isipadu minyak tangki.
B. Suatu nisbah isipadu minyak tangki kepada isipadu reservoir.

C. A ratio of reservoir volume of gas to the volume of surface oil.
D. A ratio of tank oil volume occupied to volume of rock that contains oil.

C. Suatu nisbah isipadu reservoir bagi gas kepada isipadu minyak di permukaan.
D. Suatu nisbah isipadu minyak tangki kepada isipadu batuan yang mengandungi minyak.

1.23 Bubble point pressure is the pressure at which .....

A. the bubble burst in the crude oil.
B. the crude oil starts boiling.
C. liquidified natural gas starts boiling.
D. the first bubble starts to evolve from the reservoir fluid.

1.23 Tekanan titik gelembung ialah tekanan di mana .....

A. gelembung pecah di dalam minyak mentah.
B. minyak mentah mula mendidih.
C. gas asli cecair mula mendidih.
D. gelembung pertama mula dilepaskan daripada bendalir reservoir.

1.24 Malaysia has a proven oil reserve of 3.9 billion barrels of oil. What is the life of this oil reserve if the production is at the average of 700,000 bbl/day?

A. 15 years C. 30 years
B. 10 years D. 18 years

1.24 Malaysia mempunyai rizab minyak terbukti sebanyak 3.9 billion tong. Apakah hayat rizab minyak ini sekiranya pengeluaran purata sebanyak 700,000 tong sehari?

A. 15 tahun C. 30 tahun
B. 10 tahun D. 18 tahun

The following problem is for questions 1.25 to 1.27

An oil field is discovered having an area of 10 000 acres with 20 feet thickness of reservoir rock, average rock porosity of 30% and the oil saturation of 70%. The formation volume factor is found to be 1.25 and the average recovery factor for the area is 35%.

Masalah berikut adalah untuk soalan 1.25 hingga 1.27

Suatu lapangan minyak telah dijumpai dengan keluasan 10 000 ekar serta 20 kaki ketebalan batuan reservoir, keporosan batuan purata 30% dan ketepuan minyak 70%. Faktor isipadu formasi didapati 1.24 dan faktor perolehan purata bagi kawasan ini ialah 35%.

1.25 What is the OOIP or IOIP of the reservoir?

A. 260.67 MSTB
B. 260.67 STB
C. 260.67 MMSTB
D. 260.67 x 10^5 STB

1.25 Apakah OOIP atau IOIP bagi reservoir ini?

A. 260.67 MSTB
B. 260.67 STB
C. 260.67 MMSTB
D. 260.67 x 10^5 STB

1.26 What would be the connate water saturation?

A. 0.3 C. 0.2
B. 0.7 D. 0.4

1.26 Apakah ketepuan air tersekap?

A. 0.3 C. 0.2
B. 0.7 D. 0.4

1.27 What would be the reserves of this oil field?

A. 91.2 MSTB C. 91.2 MMSTB
B. 91.2 STB D. 91.2x10^{-5} STB

1.27 Apakah rizab lapangan minyak ini?

A. 91.2 MSTB C. 91.2 MMSTB
B. 91.2 STB D. 91.2x10^{-5} STB

1.28 In general, the elevated pressures with depth are due to one or both of two causes. These are:

I. Overburden pressure due to the existence of hydrocarbon deposits.
II. Hydrostatic pressure imposed by the weight of fluid (predominantly water) which fills the voids of the rocks above and contiguous with reservoir in question.
III. Overburden pressure due to the weight of the rocks and their fluid content existing above the reservoir.
IV. Overburden pressure due to the high temperature of the confining rock.

A. I and II
B. II and IV
C. II and III
D. III and IV

1.29 While drilling, the main techniques to establish the location of oil and gas zones in formation evaluation are by the following:

I. Evaluation on the drilling fluid.
II. Inspection on the drill cuttings.
III. Inspection on the core samples.
IV. Using the computer

A. All of the above
B. I, II and III
C. I, II and IV
D. I, III and IV

1.30 In drilling a well, the drilling bit is being lubricated by .....

A. grease
B. the crude oil that flows upward.
C. drilling fluid
D. gas bubbles

1.31 Water has a specific gravity of 1.0 or the density of 8.33 ppg. To increase the specific gravity of this fluid, in oil well drilling, a weighing material is added. The material being a mineral known as .....

A. bentonite
B. cassiterite
C. sphalerite
D. barite

1.28 Secara amnya, tekanan meningkat dengan kedalaman disebabkan oleh satu atau kedua-dua daripada dua sebab iaitu:

I. Tekanan beban atas di sebabkan kepada kewujudan mendapan hidrokarbon.
II. Tekanan hidrostatik yang dikenakan oleh berat bendalir (kebanyakannya ialah air) yang memenuhi rongga-rongga batuan di atas dan bersentuhan dengan reservoir.
III. Tekanan beban atas disebabkan oleh berat batuan dan kandungan airnya yang terdapat di atas reservoir.

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IV. Tekanan atas disebabkan oleh suhu tinggi daripada batuan yang terkurung

A. I and II
B. II dan IV
C. II and III

1.28 Semasa menggerudi, teknik utama untuk menentukan kedudukan zon minyak dan gas dalam penilaian formasi adalah seperti berikut:

I. Penilaian ke atas bendalir pengerudian.
II. Pemeriksaan ke atas rincisan gerudi.
III. Pemeriksaan ke atas sampel teras.
IV. Menggunakan komputer

A. Semua di atas
B. I, II dan III
C. I, II dan IV
D. I, III danIV

1.30 Dalam penggerudian sebuah telaga, bit penggerudi dilicinkan oleh .....

A. minyak gris
B. minyak mentahyang mengalir ke atas
C. bendalir pengerudian.
D. gelembung gas

1.31 Air memepunyai graviti tentu 1.0 atau ketumpatan 8.33 ppg. Untuk menaikkan graviti tentu bagi bendalir ini, dalam penggerudian telaga minyak, suatu bahan pemberat ditambah. Bahan ini ialah suatu mineral yang dikenali sebagai .....

A. bentonit
B. kasiterit
C. spalerit
D. barit

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1.32 Another mineral is also used to control the gel property of the drilling mud. What is this mineral?

A. shale
B. bentonite
C. barite
D. sphalerite

1.33 The drilling fluid for oil well is basically a mixture of .....

I. water
II. clay
III. weighting material
IV. sea water

A. II, III and IV
B. I, II and III
C. I and II
D. II and III

1.34 The formation pressure at the depth of 3 000 feet is 2 000 psi. What is the required mud weight suitable for drilling this formation?

A. 11.0 ppg
B. 12.8 ppg
C. 8.33 ppg
D. 9.0 ppg

1.35 In general all modern oil well are drilled using the .....

A. cable tool drilling method
B. rotary drilling method
C. percussive drilling method
D. water drilling method

1.36 In rotary drilling the drill stem is rotated by means of .....

A. a chain attached from the engine
B. a belt attached from the engine.
C. the rotary table on the drilling rig.
D. pressure from the mud.

1.37 The equipment which is always being attached at the collar of the hole while drilling a well is the .....

A. christmas tree
B. safety valve
C. blowout preventer
D. mud pump

1.32 Satu lagi mineral juga digunakan untuk mengawal sifat gel bendalir pengerudian. Apakah mineral ini?

A. Syal
B. Bentonit
C. barit
D. spalerit

1.33 Bendalir penggerudian untuk telaga minyak pada asasnya merupakan suatu campuran .....

I. Air
II. lempung
III. bahan pemberat
IV. air laut

A. II, III and IV
B. I, II and III
C. I and II
D. II and III

1.34 Tekan formasi pada kedalaman 3 000 kaki ialah 2 000 psi. Apakah berat lumpur yang diperlukan supaya ia sesuai untuk penggerudian formasi ini?

A. 11.0 ppg
B. 12.8 ppg
C. 8.33 ppg
D. 9.0 ppg

1.35 Secara amnya semua telaga minyak moden digerudi dengan menggunakan .....

A. kaedah pengerudian alat kabel
B. kaedah pengerudian putar
C. kaedah pengerudian hentakan
D. kaedah pengerudian air

1.36 Dalam penggerudian putar, batang gerudi diputar oleh .....

A. suatu rantaian daripada enjin.
B. suatu talisawat daripada enjin.
C. meja putar yang terdapat di atas alat penggerudi.
D. tekanan daripada lumpur.

1.37 Peralatan yang sentiasa disambungkan di bahagian atas lubang semasa menggerudi telaga minyak ialah .....

A. christmas tree
B. injap keselamatan
C. penahan sembur liar
D. pam lumpur

1.38 While drilling, one third or half of the hole is being cased with steel casing and cemented to the borehole. The main purpose for this is .....

A. to ensure that drilling is always vertical.
B. to prevent oil from entering into the well.
C. to ensure that the drill mud will not pollute the surrounding rock.
D. to control the pressure in the borehole.

1.39 What is the main purpose of hoisting system in a drilling rig?

A. To support the drilling string while drilling and to hoist the pipe out the hole.
B. To assist the roughnecks to lift heavy objects.
C. To assist the mud engineer to lift bags of barite to be poured into the drill hole.
D. To assist the toolpusher to push drilling tools into the drill hole.

1.40 After drilling, the casing is cemented followed by perforation and placement of production tubing. Then the christmas tree is installed on the wellhead. The christmas tree is made up of .....

A. oil production pipes
B. a set of valves and chokes
C. a blowout preventer
D. oil quality monitoring instrument

1.41 Casing is set to give protection to the well. How does the casing is installed in the borehole?

A. It is set all along the hole and hangs from the well head.
B. The casing is lowered until the required depth, hanged at the well head and cemented to the borehole.
C. The casing is set using concrete which is durable from attack of oil and gas.
D. The drill collars are cemented to the borehole and used as casing.

1.38 Semasa menggerudi, satu pertiga atau separuh daripada lubang dilitupi dengan selongsong keluli dan disimenkan kepada lubang gerudi. Tujuan utama untuk ini ialah .....

A. bagi memastikan penggerudian sentiasa dalam keadaan menegak.
B. Bagi menghindari minyak daripada memasukki telaga.
C. Bagi memastikan lumpur penggerudian tidak mencemarkan batuan di sekitarnya.
D. Bagi mengawal tekanan di dalam lubang gerudi.

1.39 Apakah tujuan utama sistem hois di dalam rig penggerudian?

A. Untuk menyokong talian gerudi semasa menggerudi dan untuk menarik keluar paip daripada lubang.
B. Untuk membantu pekerja-pekerja mengangkat barang berat.
C. Untuk membantu jurutera lumpur mengangkat barit dan dimasukkan ke dalam lubang gerudi.
D. Untuk membantu toolpusher menolak peralatan menggerudi ke dalam lubang gerudi.

1.39 Setelah penggerudian selesai, selongsong disimenkan dan diikuti oleh penebukan dan memasang tiub pengeluaran. Kemudian itu 'christmas tree' dipasang di kepala telaga. Christmas tree terdiri daripada .....

A. paip pengeluaran minyak.
B. suatu set injap dan pencekik.
C. penahan sembur liar.
D. peralatan pemantauan kualiti minyak.

1.41 Selongsong dipasang bagi memberi perlindungan kepada telaga. Bagaimanakah selongsong ini dipasang di dalam lubang gerudi?

A. Ia dipasang di sepanjang lubang dan digantung daripada kepala telaga.
B. Selongsong diturunkan sehingga kedalaman yang diperlukan, digantung di kepala telaga dan disimenkan ke lubang gerudi.
C. Selongsong dipasang dengan menggunakan konkrit yang mana ia lebih tahan daripada serangan minyak dan gas.
D. Relang gerudi disimenkan kepada lubang gerudi dan digunakan sebagai selongsong.

1.42 How to open a passage way for the flow of oil from the formation to the well, after the well has been completed with cemented casing?

A. At the bottom of the casing there is a valve which is already in place. The opening of this valve will let the oil to flow into the well.
B. The production tubing and packer is lowered and installed near the formation.
C. The passage is always open because at the formation, there is no casing and cement.
D. The casing is perforated with shaped charges in areas where the formation is located.

1.42 Bagaimanakah membuka laluan minyak supaya mengalir daripada formasi ke dalam telaga, setelah telaga dilengkapkan dengan selongsong yang sudah disimenkan?

A. Di bahagian bawah selongsong terdapat satu injap yang tersedia. Injap ini dibuka untuk membolehkan minyak mengalir ke dalam telaga.
B. Tiub pengeluaran dan penyendat diturunkan dan dipasangkan berhampiran dengan formasi.
C. Laluan sentiasa terbuka kerana di formasi, tiada terdapat selongsong dan simen.
D. Selongsong ditebuk dengan menggunakan 'shaped charges' di kawasan yang terdapat formasi.

1.43 One of the methods to evaluate the formation is to observe the drilling fluid that returns to the surface while drilling and this method is referred as .....

A. mud logging
B. monitoring mud properties
C. measurement of mud density
D. drill cutting study

1.43 Salah satu kaedah untuk menilai formasi ialah dengan membuat pemerhatian terhadap bendalir penggerudian yang kembali ke permukaan semasa penggerudian dijalankan dan kaedah ini dikenali sebagai .....

A. pengelogan lumpur.
B. pemantauan sifat lumpur.
C. pengukuran ketumpatan lumpur.
D. kajian rincisan penggerudian.

1.44 What will happen when the drill pipe (while drilling) passes through shale that contains bentonite or other hydratable clays which continually adsorb water, swell and slough into the hole?

A. Nothing will happen as the mud will remove drill cuttings efficiently and include broken rock material from the sidewalls.
B. The shale will heave and may result in pipe stuck in the hole.
C. The bentonite will help improve the quality of the drilling fluid.
D. The bentonite will improve the quality of the drilling fluid and will suspend the drill cuttings and broken rock in the mud.

1.44 Apakah yang akan terjadi apabila paip penggerudian (semasa menggerudi), melalui syal yang mengandungi bentonit atau lempung lain yang sentiasa menyerap air, mengembang dan runtuh ke dalam lubang?

A. Tiada apa yang akan terjadi kerana lumpur akan mengeluarkan rincisan gerudi dengan cekap dan ini termasuklah bahan batuan yang kelar daripada dinding sisi.
B. Syal akan mengembang dan boleh mengakibatkan paip terlekat di dalam lubang.
C. Bentonit akan membantu memperbaiki kualiti bendalir penggerudian.
D. Bentonit akan memperbaiki kualiti bendalir penggerudian dan akan menggantungkan rincisan gerudi dan batuan yang pecah di dalam lumpur.

1.45 What are two types of coring that can be carried out in oil exploration?

I. Conventional coring
II. Directional coring

1.45 Apakah dua jenis teras batuan yang boleh dilakukan dalam eksplorasi minyak?

I. penerasan konvensional
II. penerasan berarah

III. Side wall coring
IV. Explosive coring

A. I and II
B. I and III
C. I and IV
D. II and IV

1.46 The main purpose of obtaining the cores is to conduct tests for the following information:

I. Type of rock
II. Rock porosity
III. Permeability
IV. Orientation of formation

A. All of the above
B. II and III
C. II, III and IV
D. I, II and III

1.47 Radioactive technique used in well logging to determine the rock density is .....

A. Neutron logging
B. Laterolog
C. Caliper
D. Gamma ray logging

1.48 In electrical logging, one of the techniques is to find out the water and oil saturation in the formation. What kind of logging is this?

A. Resistivity logging
B. Microlaterolog
C. Microlog
D. S.P. Method

1.49 An important test is performed to collect data on pressure of the potential formation that would produce oil or gas before the setting of casing. This equipment is installed in the drilling assembly. This test is the .....

A. formation pressure testing
B. formation testing
C. drilling test
D. drill stem testing

1.50 After a well is drilled and completed in a newly discovered oil field, the oil may flow into the well by .....

A. sucker rod pumping
B. gas lifting

III. penerasan dinding sisi
IV. penerasan letupan

A. I dan II
B. I dan III
C. I dan IV
D. II dan IV

1.46 Tujuan utama mendapatkan teras ialah untuk menjalankan ujian-ujian untuk maklumat berikut:

I. jenis batuan
II. keporosan batuan
III. kebolehtelapan
IV. orentasi formasi

A. Semua di atas
B. II dan III
C. II, III dan IV
D. I, II dan III

1.47 Teknik radioaktif yang digunakan dalam pengelogan telaga untuk menentukan ketumpatan batuan ialah .....

A. pengelogan neutron
B. laterolog
C. caliper
D. pengelogan sinaran gamma

1.48 Dalam pengelogan elektrik, salah satu daripada teknik-teknik ini ialah untuk mendapatkan ketepuan air dan minyak di dalam formasi. Apakah jenis pengelogan ini?

A. Pengelogan kerintangan
B. Microlaterolog
C. Microlog
D. Kaedah S.P.

1.49 Satu ujian yang penting dijalankan untuk mengumpul data mengenai tekanan bagi formasi yang berpotensi menghasilkan minyak dan gas sebelum pemasangan selongsong. Peralatan ini dipasang di dalam pemasangan penggerudian. Ujian ini ialah .....

A. ujian tekanan formasi
B. ujian formasi
C. ujian penggerudian
D. ujian batang gerudi

1.50 Selepas sebuah telaga digerudi dan dilengkapkan di suatu lapangan minyak yang baru dijumpai, minyak boleh mengalir ke dalam telaga melalui .....

A pam rod penghisap
B. pengangkatan gas

C. natural flow
D. christmas tree

C. aliran smula jadi
D. christmas tree

1.51 In calculating the oil reserves, normally a recovery value of between 20 to 25% is used. What do these values based on?

A. It is based on the recovery normally obtained while in the primary stage of production.
B. It is based on the permeability and the porosity of the reservoir rock.
C. It is based on the actual total amount of oil and gas from the reservoir.
D. It is based on the production without any assistance.

1.51 Dalam mengira rizab minyak, kebiasaannya nilai perolehan di antara 20 hingga 25% digunakan. Berdasarkan apakah nilai-nilai ini?

A. Ia berdasarkan kepada perolehan yang biasa didapati semasa pengeluaran di peringkat primer.
B. Ia berdasarkan kepada kebolehtelapan dan keporosan batuan reservoir.
C. Ia berdasarkan kepada amaun total sebenar bagi minyak dan gas daripada reservoir.
D. Ia berdasarkan kepada pengeluaran tanpa apa-apa bantuan.

1.52 What is formation damage?

A. The damage caused to the formation such as hole sloughing while drilling.
B. The damage caused to the formation due to the incorrect practice of well perforation.
C. The damage to the formation due to the incorrect practice of cementing operation.
D. Permeability alteration that may occur around the well bore as a result of drilling and completion operations.

1.52 Apakah kerosakan formasi?

A. Kerosakan terjadi ke atas formasi seperti keruntuhan lubang semasa penggerudian.
B. Kerosakan terjadi ke atas formasi disebabkan oleh amalan salah semasa penebukan telaga.
C. Kerosakan kepada formasi disebabkan oleh amalan salah semasa operasi menyimen.
D. Perubahan kebolehtelapan yang boleh berlaku di sekeliling lubang telaga akibat daripada operasi penggerudian dan pelengkapan.

1.53 The oil will flow from the well and straight to a separator. What is the function of the separator?

I. To separate natural gas and oil.
II. To separate oil and water.
III. To refine crude oil.
IV. To separate drill cuttings from oil.

A. All of the above
B. I, II and III
C. I, II and IV
D. I and II

1.53 Minyak akan mengalir daripada telaga dan terus kepada separator. Apakah fungsi separator?

I Untuk mengasingkan gas asli dan minyak.
II. Untuk mengasingkan minyak dan air.
III. Untuk penapisan minyak mentah.
IV. Untuk mengasingkan rincisan gerudi daripada minyak.

A. Semua di atas
B. I, II dan III
C. I, II dan IV
D. I dan II

1.54 Natural gas is produced from the oil well, gas well and condensate well. What are the main components of gases that made up the natural gas?

A. Propane and butane
B. Methane and ethane
C. Methane and propane
D. Methane and Butane

1.54 Gas asli dihasilkan daripada telaga minyak, telaga gas dan telaga kondensat. Apakah komponen utama gas-gas yang di dapati di dalam gas asli?

A. Propana dan butana
B. Metana dan etana
C. Metana dan propana
D. Metana dan butana

1.55 Figure 1 is a technique for secondary recovery of oil. What is it?

A. Oil injection
B. Gas injection
C. Natural flow
D. Water flooding

1.55 Rajah 1 adalah teknik untuk perolehan sekunder. Apakah ia?

A. injeksi minyak
B. injeksi gas
C. aliran semulajadi
D. pembanjiran air

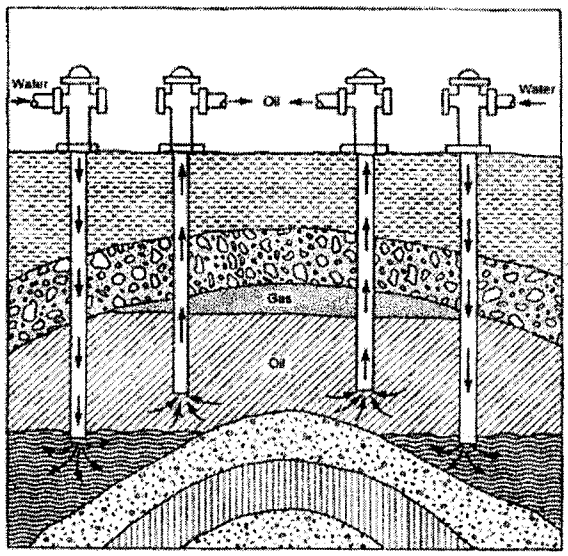


Figure 1
Rajah 1

1.56 The pipe for transporting oil is cleaned periodically by releasing a pig through the pipe. The pig is pushed through the pipe by the pump pressure. What is the pig?

A. A small animal that fed on oil grease.
B. A solid rubber object which is spherical or cylindrical in shape.
C. A pipe cleaning tool controlled electronically.
D. A brush.

1.56 Paip untuk mengangkut minyak dibersihkan dalam tempoh masa tertentu dengan melepaskan tetikus melalui paip. Tetikus ini ditolak melalui paip oleh tekanan daripada pam. Apakah tikus-tikus ini?

A. Seekor binatang kecil yang makan minyak gris.
B. Suatu objek pepejal getah yang berbentuk spiar atau silinder.
C. Alat membersih paip yang dikawal secara elektronik.
D. Berus

The answers for questions 1.57 dan 1.58 refer to Figure 2.

Jawapan kepada soalan 1.57 dan 1.58 merujuk kepada Rajah 2.

1.57 Open hole liner completion?

1.57 Pelengkapan pelapik lubang terbuka?

1.58 From the four types of completion, which one is the common type used for a well that do not experience abnormal formation pressure?

1.58 Daripada empat jenis pelengkapan, jenis yang manakah yang paling biasa digunakan untuk telaga yang tidak mengalami tekanan formasi tak biasa?

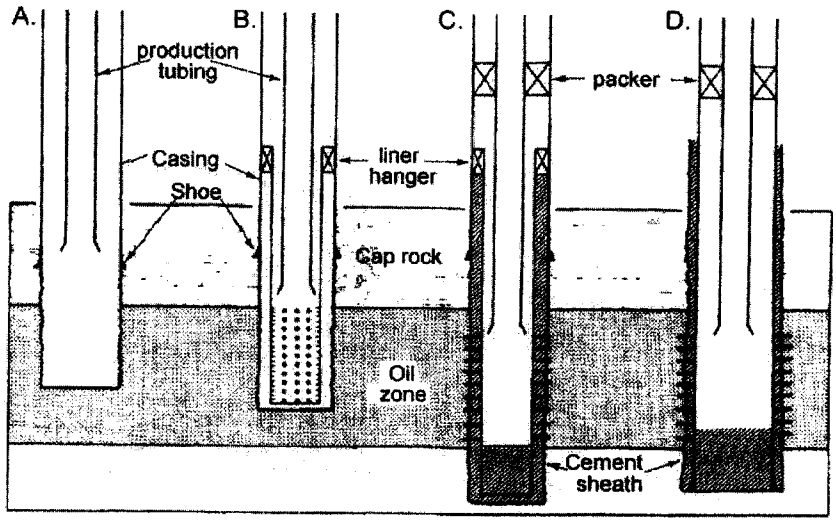


Figure 2
Rajah 2

1.59 A hole drilled can be deviated by means of the following down the hole equipment.

I. a whipstock
II. a bent sub
III. flexible drilling pipe
IV. flexible hose

A. All of the above
B. I and II
C. III only
D. III and IV

1.59 Suatu lubang boleh dibengkukkan dengan peralatan di bawah lubang seperti berikut.

I. whipstock
II. sub bengkuk
III. paip penggerudian yang fleksibel
IV. hos fleksibel

A. Semua di atas
B. I dan II
C. III sahaja
D. III dan IV

1.60 Desanders, desilters are used to remove sand and silt from the drilling fluid. Basically, what are these equipments?

A. seives
B. filters
C. hydrocyclones
D. rock filters

1.60 Pengenyahpasir, pengenyahkelodak digunakan untuk mengasingkan pasir dan kelodak daripada bendalir penggerudian. Pada asasnya, apakah perlatan ini?

A. ayak
B. penapis
C. hidrosaiklon
D. penapis batu

(50 marks)

(50 markah)

SECTION B
Bahagian B

This section consists of questions number 2, 3 and 4.
You are required to answer any 2 (two) of them.

Bahagian ini mengandungi soalan nombor 2, 3 dan 4
Anda diperlukan menjawap mana-mana dua(2) soalan.

2. a. Write a brief account on the methods used in the production of oil.

(12 marks)

b. An oil well of radius of r_w having the well bore pressure of p_w is producing oil from a reservoir with its area of influence of radius r_e and the static reservoir pressure of p_e.

Using the Darcy's law $v = -\frac{k}{\mu}\frac{dp}{dL}$ with usual notation

Derive the following relationship

$$q = \frac{7.07hk(p_e - p_w)}{\mu \ln \frac{r_e}{r_w}} \text{ bbl/day}$$

For a reservoir rock of thickness h feet with a permeability of k darcy that contains oil of viscosity μ centipoise. The pressure is expressed in psi.

(13 marks)

2. *a.* *Tuliskan secara ringkas mengenai kaedah-kaedah yang digunakan dalam pengeluaran minyak.*

(12 markah)

b. *Sebuah telaga minyak menpunyai jejari r_w dan tekanan dalam telaga p_w sedang mengeluarkan minyak dengan kawasan pengaruhnya berjejarai r_e dan tekanan reservoir statik p_e*

Dengan menggunakan hukum Darcy: $v = -\frac{k}{\mu}\frac{dp}{dL}$

Terbitkan hubungan berikut:

$$q = \frac{7.07hk(p_e - p_w)}{\mu \ln\left(\frac{r_e}{r_w}\right)} \text{ tong/hari}$$

Untuk batuan reservoir yang ketebalannya h kaki, kebolehtelapan k darcy yang mengandungi minyak dengan kelikatan μ centipoise. Tekanan disebut dalam psi.

(13 markah)

3. a. Briefly describe the cementing operation for an oil well in cementing the casing to the well bore. You may describe with the aid of skeches.

(15 marks)

b. The reservoir rock around an oil well of 8 inches diameter is having an altered zone (formation damage) of radius 2 feet and a permeability of 5 md. The drainage radius of the well is 700 feet with the unaltered zone of the reservoir rock of permeability of 500 md. What is the average or equivalent permeability that will govern the productivity of the well?

(10 marks)

3. a. Terangkan dengan ringkas operasi penyimenan untuk sebuah telaga minyak semasa menyimen casing kepada lubang telaga. Anda boleh beri penerangan dengan bantuan lakaran.

(15 markah)

b. Batuan reservoir di sekeliling sebuah telaga minyak yang bergarispusat 8 inci terdapat zon perubahan (kerosakan formasi) dalam jejari 2 kaki dan kebolehtelapan 5 md. Jejari saliran telaga ini ialah 700 kaki dengan zon yang tidak berubah daripada batuan reservoir ini mempunyai kebolehtelapan 500 md. Apakah kebolehtelapan purata atau kebolehtelapan setara yang akan mengawal pengeluaran telaga ini?

(10 markah)

4. a. A field offshore Terengganu has one of its formations with an area of 900 acres with the average sand thickness of 30 feet at a depth of 8,000 feet. From tests carried out on core samples and tests while drilling, the reservoir rock porosity is 22%, the connate water saturation of 27%, the static pressure gradient of 0.6 psi/feet and the temperature gradient of 1.4^0F/100 feet. The surface average temperature is 80^0F.

i. If the field consists of oil, calculate the original oil in place in STB if the formation oil volume factor is 1.20 RB/STB.

(5 marks)

ii. If it is a gas field with gas specific gravity of 0.7, calculate the gas in place in SCF.

(10 marks)

b. What are the purposes of directional drilling? Describe with the aid of sketches.

(10 marks)

4. a. *Sebuah lapangan minyak lepas pantai Terengganu mempunyai salah satu daripada formasinya berkeluasan 900 ekardengan ketebalan purata pasir 30 kaki pada kedalaman 8,000 kaki. Daripada ujian yang dijalankan ke atas sampel teras dan ujian-ujian semasa penggerudian, keporosan batuan reservoir 22%, ketepuan air tersekap 27%, kecerunan tekanan statik 0.6 psi/kaki dan keceruan suhu1.4^{0}F/100 kaki. Suhu purata permukaan pula ialah 80^{0}F*

i. Jika lapangan ini mengandungi minyak, kirakan minyak asal di tempat dalam STB jika faktor isipadu formasi 1.2 RB/STB.

(5 markah)

ii. Jika lapangan ini merupakan sebuah lapangan gas dengan graviti tentu gas 0.7, kirakan gas di tempat dalam SCF.

(10 markah)

b Apakah tujuan penggerudian berarah? Terangkan dengan bantuan lakaran.

(10 markah)

ooo0ooo

Formula and guide:

1 bbl = 150,000 cm^3

1 bbl = 5.615 ft^3

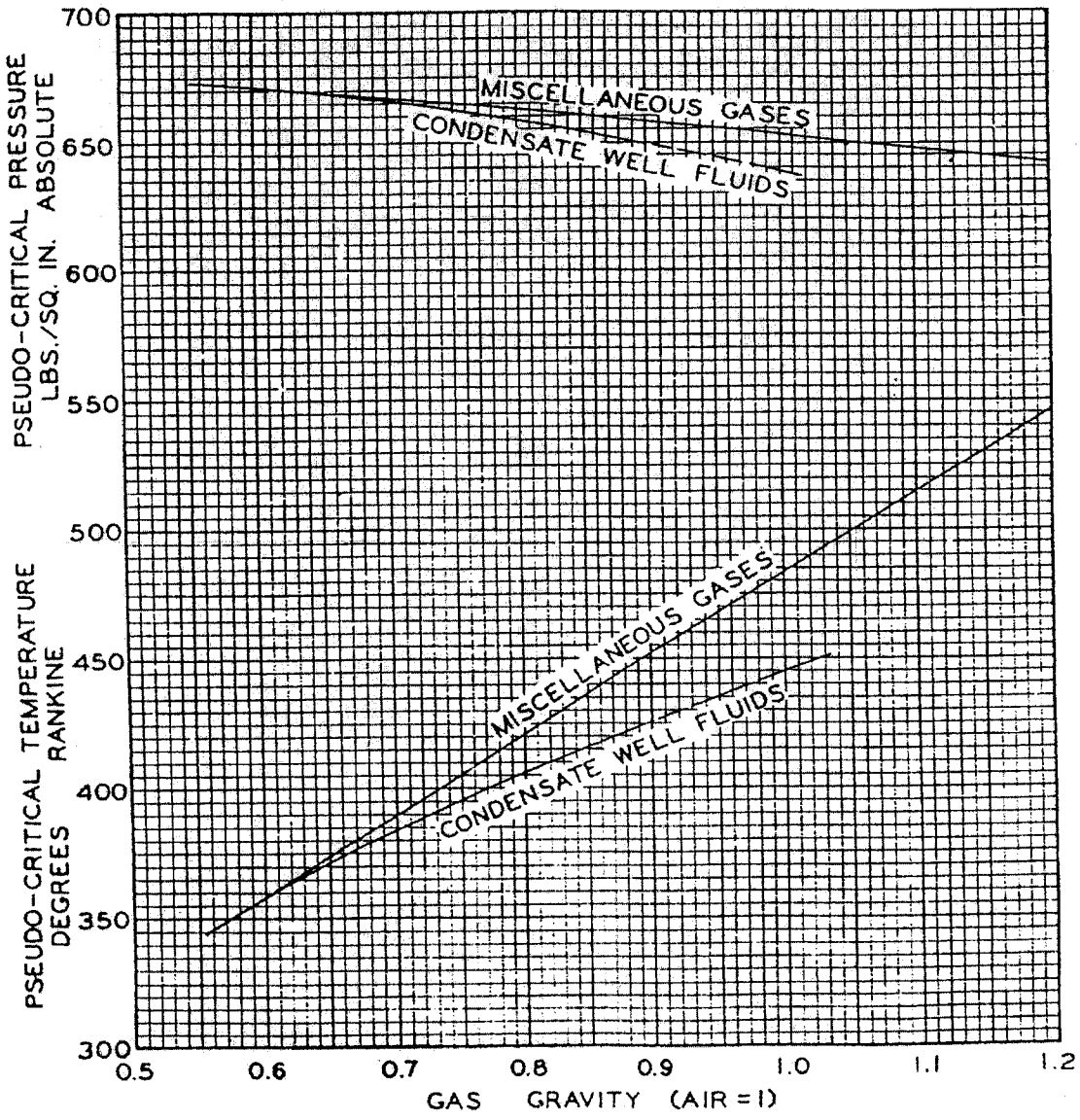
1 ft = 30.48 cm

1 atm = 14.7 psi

1 acre = 43,560 ft^2

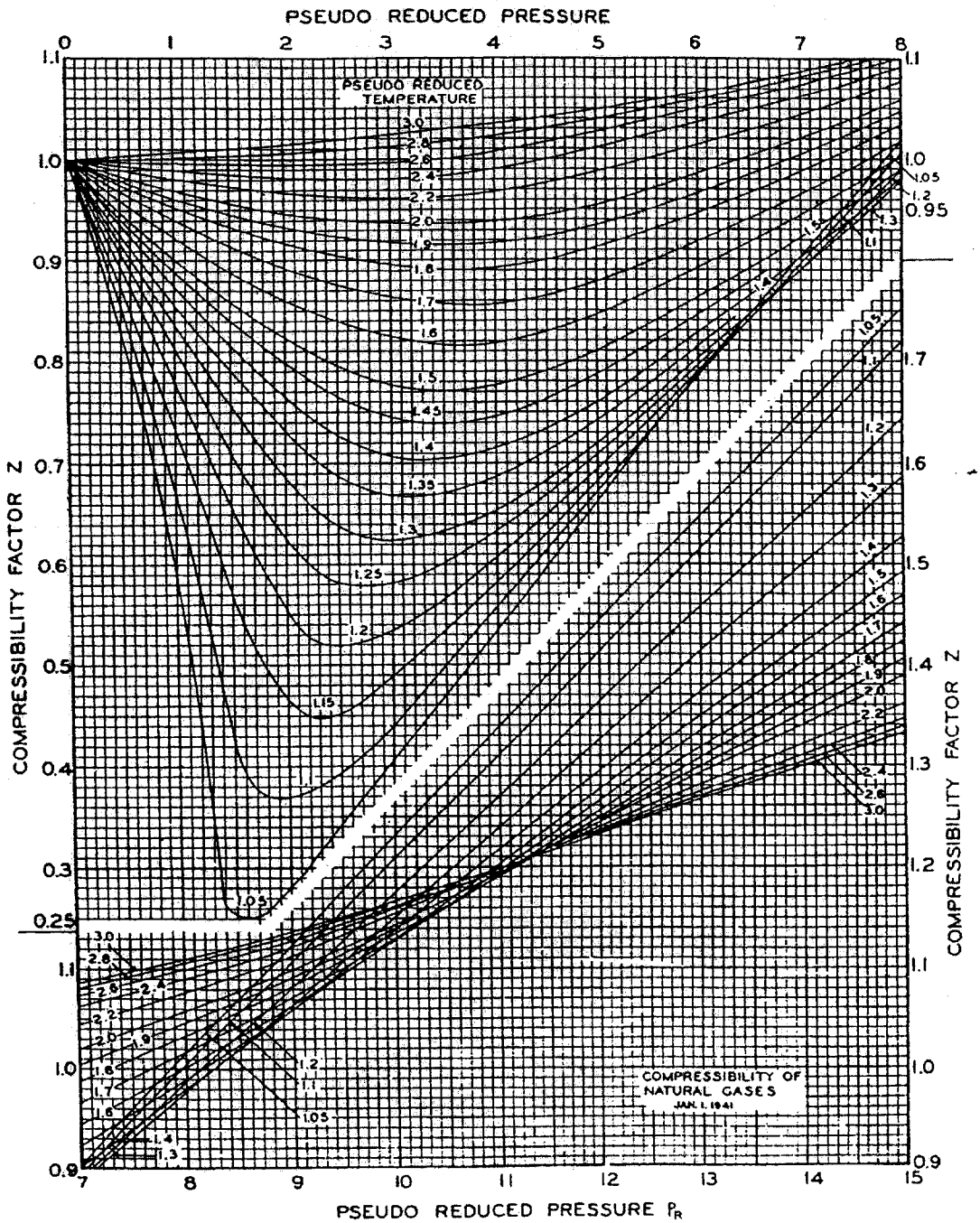
$$\bar{k} = \frac{\ln(r_e / r_w)}{\frac{1}{k_e}\ln(r_e / r_a) + \frac{1}{k_a}\ln(r_a / r_w)}$$

Appendix 1
Lampiran 1



Pseudo-critical properties of natural gases as functions of gas gravity. Courtesy G. G. Brown, et al

Appendix 2
Lampiran 2



Compressibility of natural gases as a function of reduced pressure and temperature.

After Standing and Katz, courtesy AIME

Appendix 3
Lampiran 3

UNIVERSITI SAINS MALAYSIA

SECOND SEMESTER EXAMINATION 2004/2005
PEPERIKSAAN SEMESTER KEDUA 2004/2005

EBS 418E/3
PETROLEUM ENGINEERING
KEJURUTERAAN PETROLEUM

OBJECTIVE QUESTIONS ANSWER SHEET

Examination Index Number :
Angka Giliran Peperiksaan: .....
(in words):
(dalam perkataan): .....

Blacken the correct answer using any suitable pencil.

1.1	=A=	=B=	=C=	=D=	1.21	=A=	=B=	=C=	=D=	1.41	=A=	=B=	=C=	=D=
1.2	=A=	=B=	=C=	=D=	1.22	=A=	=B=	=C=	=D=	1.42	=A=	=B=	=C=	=D=
1.3	=A=	=B=	=C=	=D=	1.23	=A=	=B=	=C=	=D=	1.43	=A=	=B=	=C=	=D=
1.4	=A=	=B=	=C=	=D=	1.24	=A=	=B=	=C=	=D=	1.44	=A=	=B=	=C=	=D=
1.5	=A=	=B=	=C=	=D=	1.25	=A=	=B=	=C=	=D=	1.45	=A=	=B=	=C=	=D=
1.6	=A=	=B=	=C=	=D=	1.26	=A=	=B=	=C=	=D=	1.46	=A=	=B=	=C=	=D=
1.7	=A=	=B=	=C=	=D=	1.27	=A=	=B=	=C=	=D=	1.47	=A=	=B=	=C=	=D=
1.8	=A=	=B=	=C=	=D=	1.28	=A=	=B=	=C=	=D=	1.48	=A=	=B=	=C=	=D=
1.9	=A=	=B=	=C=	=D=	1.29	=A=	=B=	=C=	=D=	1.49	=A=	=B=	=C=	=D=
1.10	=A=	=B=	=C=	=D=	1.30	=A=	=B=	=C=	=D=	1.50	=A=	=B=	=C=	=D=
1.11	=A=	=B=	=C=	=D=	1.31	=A=	=B=	=C=	=D=	1.51	=A=	=B=	=C=	=D=
1.12	=A=	=B=	=C=	=D=	1.32	=A=	=B=	=C=	=D=	1.52	=A=	=B=	=C=	=D=
1.13	=A=	=B=	=C=	=D=	1.33	=A=	=B=	=C=	=D=	1.53	=A=	=B=	=C=	=D=
1.14	=A=	=B=	=C=	=D=	1.34	=A=	=B=	=C=	=D=	1.54	=A=	=B=	=C=	=D=
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1.16	=A=	=B=	=C=	=D=	1.36	=A=	=B=	=C=	=D=	1.56	=A=	=B=	=C=	=D=
1.17	=A=	=B=	=C=	=D=	1.37	=A=	=B=	=C=	=D=	1.57	=A=	=B=	=C=	=D=
1.18	=A=	=B=	=C=	=D=	1.38	=A=	=B=	=C=	=D=	1.58	=A=	=B=	=C=	=D=
1.19	=A=	=B=	=C=	=D=	1.39	=A=	=B=	=C=	=D=	1.59	=A=	=B=	=C=	=D=
1.20	=A=	=B=	=C=	=D=	1.40	=A=	=B=	=C=	=D=	1.60	=A=	=B=	=C=	=D=